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ABSTRACT

A study is undertaken to determine whether the nonlinguistic priority of the agent of an action facilitates the comprehension of word reference. The subjects were twelve male and twelve female infants at the one word stage of language production. The children were presented with three nonsense names (presented as part of a narration of a filmed action event) to learn in habituation series. Each nonsense name was associated with a puppet. Findings indicate that action role has implications for learning to name objects. In general, the infants did dishabituate to all mismatches in all conditions and transferred their knowledge of the word-referent relationship from the film presentations to the actual objects involved. The perceptual strategy of giving priority to the agent is important in the acquisition of a word. Semantic concepts which are easier for the child to grasp may provide natural focal points for language acquisition. The data also suggest that participation in an action event increases a child's attention to a new word more than nonparticipation in an event. Specific attention directing strategies, such as giving attentional priority to the agent of the action, are critical aids to the acquisition of word-referent relationships. (Author/JK)

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The Role of Attentional Priority of the Agent in the Acquisition of Word Reference

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A prominent aspect of early language is naming people and objects. This is a simple form of reference - that is, the word actually refers to a concrete object or being. Not all word-referent relationships are of this nature (e.g., idea, possibility). However, in the transition from prelinguistic communication to language, labeling concrete entities is a high frequency occurence. How does the child come to understand the relationship between the object and the word which refers to the object?

One could look for an origin of word-referent relations in the cognitive base of language, especially the child's understanding of functional relationships. The child brings considerable knowledge of objects and events to the word learning situation. Piaget has detailed the extent of the sensorimotor child's knowledge of actions and actors. The work of both Sinclair and Edwards proposes that sensorimotor intelligence provides the structures of meanings via which language refers to things in the world. Approaching the problem from the linguistic side, certain semantic descriptions of language, case grammars, have emphasized the importance of functional relations between actors, actions, and objects. For example, in discussing his case grammar, Filmore asserts that "the case notions comprise a set of universal, presumably innate concepts which identify certain judgments human beings make about events that are going on around them, judgments about such matters as who did it, who it happened to, and what got changed."

There appears to be some potential for overlap between the structure of early thought and case grammar descriptions of language.

Recently, there have been several investigations of the psychological reality of case grammar which indicate that there is considerable psychological reality to the agent case. The agentive case refers to the typically animate perceived instigator of the action, identified by the verb. Studies have found the agent to be a particularly salient aspect of nonlinguistic stimuli and the priority of the agent emerges in several age groups and across cultures. There is also a developmental progression: early in language development, children use a broader category of action initiator, while later, there is the differentiation of action initiators who are animate from those who are inanimate.

Robertson and Suci, studying infant attention to an event protraying a simple action, found that infants in the early stages of language production, distribute their attention to an event in a characteristic manner. The agent or action initiator plays a central role. The event used by Robertson and Suci portrayed an action initiator (agent) pushing down on action recipient while a third actor, a nonparticipant, remained stationary. Before the action began, the infants attended to all actors equally. However, during and after the action, they attended to the agent actor. Thus, they showed a specific attentional strategy in their processing of action events - once the action begins, attend to the agent.

Agent priority in event perception could play a role in early word reference. The salience of the agent could provide an initial structure for processing of joint language - action events. Attending to the action initiator could serve as a useful strategy, helping the child form initial hypothesis about how language relates to events. The tendency to attend to the action initiator could fix

one central aspect of real events, making it easier for the child to recognize a relationship between a specific actor in an event and a word referring to that actor.

Burner's work offers support for the notion that there is a role for specific attention in learning to label. Burner and his colleagues have hypothesized that joint attention of mother and infant is important in learning to label. He has found evidence of extensive drill about naming between mother and child. More specifically, once the attention of mother and infant is jointly directed, the mother systematically acts or comments upon what has caught their joint attention. It seems plausible that the infant's attentional strategy of giving priority to the agent and the mother's systematic actions and comments about objects attended to by the infant, may be two processes which mediate the acquisition of labels or names. This study investigates whether the nonlinguistic priority of the agent can facilitate the comprehension of word reference.

Twenty-four infants (twelve of each sex) at the one word stage of language production were presented with three nonsense names to learn in habituation series in which a nonsense name and puppet were associated. Each nonsense word (woggle, poosey, dax) was presented as part of a narration of a filmed action event. There were three film conditions: Agent, Recipient, and Control. In the Agent condition, the nonsense name referred to the agent of the action. In the recipient condition, the nonsense name referred to the recipient of the action. In the control condition, the nonsense name referred to an actor who remained stationary. So, in the Agent and Recipient conditions, the nonsense words were presented in conjunction with a filmed action event. As in

Robertson and Suci, this filmed event depicted one puppet (the agent) pushing another puppet down (the recipient) while a third puppet stood by (a nonparticipant). In the control condition, the film depicted three puppets standing still. The control condition was included in order to compare simple discrimination learning (association of name with object) to learning to label in the context of an event and the functional roles involved in an event. Each subject served as her own control, viewing all three film conditions: agent, recipient, and control. Presentation of the three films was counterbalanced.

Infant attention - specifically dishabituation - was the dependent measure. A combined measure of heart rate and visual fixation was used since coupling visual fixation with cardiac response yields a measure with the sensitivity of the cardiac measure and the face validity of visual fixation as a measure of attention. Dishabituation, i.e., recovery of attention after habituation, was used as to measure the extent to which the infant learned each nonsense name. In order to use disahibituation as a test of name acquisition, it was critical to change only <u>one</u> aspect of the joint visual-verbal presentation. To this end, each nonsense name trial was alternated with a sense name trial. If you examine Figure 1, you can see an example of a sense and nonsense trial. In the sense trial, a sense name such as "Kitty" (bear, bunny) referred to a sense puppet (i.e., a cat puppet). In the nonsense trial, a nonsense name such as "woggle", referred to a nonsense puppet, an animal-like puppet which did not resemble any single animal. The same action was depicted in both the sense and nonsense trials. A test could then be created by mismatching name with

referent. If you examine Figure 2, you can see that the narratives were recorded on two different channels of a stereotape. A test could be introduced by simply switching from channel 1 to channel 2. Thus, the verbal and visual presentation remained the same; only the correspondence between the verbal and visual input was changed.

The child was presented with the filmed alternating sense and nonsense trials, with the accompanying narrative, for each condition until s/he habituated. Again, in the agent condition, the nonsense and sense name referred to the agent. In the recipient condition, the nonsense name and sense name referred to the recipient of the agent's action. In the control condition, the names referred to one of three actors who remained stationary. Habituation was assessed for each child and for each film condition. Criteria for judging when habituation occurred were an average decrease of 30% or more in the visual and cardiac responses from the maximum prehabituation level for two consecutuve trials.

Once habituation was judged to have occurred, a test of name acquisition was introduced. As mentioned above, the test consisted of a mismatch between the name and its referent. For example, the nonsense name was now paired with the sense puppet and the sense name was paired with the nonsense puppet. Dishabituation was expected if the infants had learned the correct word-referent relationship for the nonsense name. Dishabituation was assessed as an attention recovery ratio, which measured combined visual fixation-cardiac response during the test trials relative to the maximum prehabituation response. Relative dishabituation to each film condition (agent, recipient, control) was then compared within

subjects. A second measure of word acquisition was also included. After the infant had watched the three film conditions, s/he was asked to point to the nonsense puppets named in the films. Each named nonsense puppet was presented along with an unnamed nonsense puppet. Left-right and condition presentations were counter balanced.

In addition to the comparison of action roles (agent, recipient, control), speech modification was also included as an independent variable between subjects. Half of the subjects were shown the three films in conjunction with a modified speech narration. Referring to Figure 1 again, half of the subjects heard (modified narrative) while the others heard (the nonmodified narrative).

In terms of the results, as you can see in Table 1, an ANOVA for repeated measures reveals a significant effect for action role i.e., the comparison among the agent, recipient, and control conditions. Neither sex nor speech modification had an effect on the child's acquisition of the nonsense words. The means for the response recovery ratios are presented in Table 2. Comparisons of the means showed the agent condition to be significantly more facilitative of the child's recognition of a name-referent mismatch then both the recipient and control conditions. The recipient condition was consistently more facilitative than the control, although not significantly so. Corroborating the recovery ratio data, significantly more infants picked out the agent nonsense puppets than the recipient or control nonsense puppets who were named in the films. Remarkably, some infants even named the nonsense puppets on their own when they saw them.

As can be seen in Table 1, speech modification did not have a facilitative effect on learning to label in this study. Table 3 presents the mean number of trials a subject watched in the modified and nonmodified speech conditions across the three action role conditions. Data was pooled over sex and a two-way ANOVA was computed. A significant main effect of modification was found. The means indicate that the subjects watched the films two trials longer when the films were accompanied by modified speech. So while speech modification did not facilitate name acquisition, it did tend to hold the infants' attention significantly longer. There was not a significant interaction between action role and speech modification, although the means indicate that modified speech may have held their attention longer in the recipient and control conditions.

The findings of the present study indicate that action role has implications for learning to name objects while speech modification does not. The two independent measures - VF-CR recovery ratio and picking the puppet after viewing the films - give us slightly different tests of the infants' understanding of the nonsense word. The first requires the child to recognize an incorrect use of the label while the second requires the child to use the label correctly. It seems legitimate to infer from the converging evidence from both measures that the infants did acquire the nonsense word to a limited degree. In general, they did dishabituate to all mismatches in all conditions and transferred their knowledge of the word-referent relationship from the film presentations to the actual objects involved.

Further, it appears that the perceptual strategy of giving

priority to the agent is important in the acquisition of a word. The findings of this study and others suggest that there may be considerable psychological reality to case-like categories. These categories, particularly the agentive category, may be basic units of conceptualization. Semantic concepts such as the agent which are easier for the child to grasp may provide natural focal points for language acquisition. For example, agent priority may be one regularity or operating principle children try to impose on the language learning situation, providing one simple way to learn how words relate to their referents.

While the priority of the action initiator in name acquisition emerges clearly, there is also a suggestion in the data that participation in an action event increases a child's attention to a new word more than nonparticipation in an event. While simple discrimination between static objects (as in the control condition) seems to be a possible way to learn about words, it is not the most effective. The greater salience of words used in the event could imply that knowledge of functional relations is useful in word acquisition.

Finally, speech modification did not facilitate the recognition of a mismatch between word and referent. Together, these findings suggest that increased general attention to the joint language action event as in speech modification, may not be as critical for learning about word-referent relationships as a specific attention directing strategy, such as giving attentional priority to the agent of the action.

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FIGURE 1: Representation of Sense and Nonsense Trials

One Sense Trial (Agent Condition)

Trial Seconds:	1 2 3	4 5 6	7 8 9	10 11 12	13 14 15	16 17 18
Visual:	Kitty alone	black	kitty squirrel rooster (still)	kitty - squirrel rooster (action)	kitty squirrel rooster (still)	black
Verbal . modified:	This is a kitty		See the kitty?	Where's the kitty?	There's the kitty.	
nonmodified:	This is a kitty			See the kitty?		

One Nonsense Trial (Agent Condition)

Trial Seconds:	1 2 3	4 5 6	7 8 9	10 11 12	13 14 15	16 17 18
Visual:	Woggle alone	black	woggle nonsense 1 nonsense 2 (still)	woggle - nonsense 1 nonsense 2 (action)	woggle nonsense 1 nonsense 2 (still)	black
Verbal modified:	This is a woggle.		See the woggle?	Where's the woggle?	There's the woggle.	
nonmodified:	This is a woggle.			See the woggle?		

FIGURE 2. The Narration Accompanying One Trial

Visual:	Named puppet stands alone			black			3 puppets stand			Agent pushes recipient			3 puppets stand			black		
Trial Seconds:	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18
Nonmodified Narrative Channel 1	This is a woggle.									See the woggle?								
Nonmodified Narrative Channel 2	This is a kitty.									See the kitty?								
Modified Narrative Channel 1	This is a woggle.						See the woggle?			Where's the woggle?			There's the woggle.					
Modified Narrative Channel 2	This is a kitty.						See the kitty?			Where's the kitty?			There's the kitty.					

TABLE 1. ANOVA of Cardiac Response Recovery

Source	SS	df	MS	F
Between Subjects	13.535	23		
S	.051	1	.051	.076
M	.039	1	.039	.058
SM	.062	1	.062	.093
Error	13.383	20	.669	
Within Subjects	16.930	48		
A	9.413	2	4.707	27.271**
AS	.076	2	.038	.220
AM	.293	2	.147	.852
ASM	.244	2	.122	.707
Error	6.904	40	.173	
Total	30.465	71		

**p < .01

KEY

S - Sex (12 males, 12 females)
M - Speech modification (modified, non-modified)
A - Action Role (agent, recipient, control)

TABLE 2. Mean Cardiac Response Recovery

Sex	Language Input	Action Role			Overall $\bar{X}$
		Agent	Recipient	Control	
Male	Modified	1.175	.700	.134	.670
	Nonmodified	1.211	.439	.391	.680
Female	Modified	1.046	.676	.329	.684
	Nonmodified	1.158	.323	.275	.585
	Male	1.193	.579	.262	
	Female	1.102	.500	.302	
	Modified	1.111	.688	.232	
	Nonmodified	1.185	.381	.333	
	Overall $\bar{X}$	1.148	.535	.282	

TABLE 3 ANOVA of the Number of Trials to Habituation and Mean Number of Trials

Source	SS	df	MS	F
Between	361.9	23		
M	68.0	1	68.04	5.093*
Subjects	293.9	22	13.36	
Within	410.7	48		
A	13.4	2	6.68	.78
AM	22.0	2	11.02	1.29
Mx Subjects	375.3	44	8.53	
Total	772.6	71		

*$p < .05$

Mean Number of Trials

Language Input		Action Role A	Action Role R	Action Role C	Overall Means
Modified	$\bar{X}$	11.75	12.83	11.75	12.11
	SD	3.39	3.21	2.92	
Nonmodified	$\bar{X}$	11.33	9.83	9.33	10.16
	SD	4.01	2.66	2.71	